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EXAMINER

COLUCCI, MICHAEL C

ART UNIT

PAPER NUMBER

2626

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                       |                                     |  |
|------------------------------|---------------------------------------|-------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/785,238  | <b>Applicant(s)</b><br>OTANI ET AL. |  |
|                              | <b>Examiner</b><br>MICHAEL C. COLUCCI | <b>Art Unit</b><br>2626             |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 January 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 33 and 34 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 33 and 34 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

**DETAILED ACTION**

***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 01/07/2009 has been entered.

***Response to Arguments***

2. Applicants arguments with respect to claims 33 and 34 have been considered but are moot in view of the new grounds of rejection. After analysis of the invention as a whole in light of the specification and drawings, Examiner has incorporated Sih US 5307405 A (hereinafter Sih) as the primary reference, wherein Sih explicitly teaches that which is well known in the art such as echo cancellation, flatness evaluation, energy level determination, sum of differences, etc. However, Examiner has also maintained the teachings of Borth et al, US 4630304 (hereinafter Borth) and Ananthaiyer et al US 6385548 B (hereinafter Ananthaiyer) but has withdrawn the teachings of Sugar et al USPGPUB 20030198304 A1 (hereinafter Sugar).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sih US 5307405 A (hereinafter Sih) in view of Borth et al, US 4630304 (hereinafter Borth) and further in view of Ananthaiyer et al US 6385548 B (hereinafter Ananthaiyer).

Re claim 33, Sih teaches an echo canceller that prevents echoes (Col. 1 lines 35-51) from occurring, comprising:

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(a) a first input controller that comprises a microphone and an A/D converter, wherein the microphone supplies the input sound signal to the A/D converter and the A/D converter converts the input sound signal into voice/noise data in digital form (Col. 1 lines 35-51);

(b) a second input controller that comprises a signal receiver and a decoder, wherein the signal receiver supplies an input coded speech signal to the decoder and the decoder decodes the input coded speech signal into decoded speech data (Col. 1 lines 35-51);

(c) an audio unit that comprises a D/A converter and a loudspeaker, wherein the D/A converter converts the decoded speech data into an analog speech signal and the loudspeaker outputs the analog speech signal as audible sound (Col. 1 line 56 – Col. 2 line 6);

(d) a coder that encodes an echo-cancelled sound signal for transmission to a remote end (Col. 1 line 56 – Col. 2 line 6, cellular phone);

(e) an input talkspurt detector comprising (Fig. 1 element 13):

an input frequency spectrum calculator that calculates voice/noise frequency spectrum of the voice/noise data (Col. 19 lines 51-61);

an input frequency spectrum calculator that calculates a voice/noise flatness factor indicating flatness of the voice/noise frequency spectrum and finds a maximum value of the voice/noise frequency spectrum, adds up differences between spectral components and the maximum value thereof, and generates a resulting sum of the

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differences as the voice/noise flatness factor (Col. 11 line 40 – Col. 12 line 30, sum of squares, & Fig. 3 flatness indication);

an input voice/noise discriminator that determines whether the voice/noise data contains a talkspurt, by comparing the normalized voice/noise flatness factor of the voice/noise frequency spectrum with a first predetermined threshold, and sets an input sound flag to indicate presence of a talkspurt in the voice/noise data (Col. 14 line 56 - Col. 15 line 6);

(f) an output talkspurt detector comprising:

an output frequency spectrum calculator that calculates speech frequency spectrum of the speech data (Col. 19 lines 51-61 & Fig. 1, method performed for both input and output operations);

an output sound flatness evaluator that calculates a speech flatness factor indicating flatness of the speech frequency spectrum and finds a maximum value of the speech frequency spectrum, adds up differences between spectral components and the maximum value thereof, and generates a resulting sum of the differences as the speech flatness factor (Col. 11 line 40 – Col. 12 line 30, sum of squares, & Fig. 3 flatness indication);

an output voice/noise discriminator that determines whether the speech data contains a talkspurt, by comparing the speech flatness factor of the speech frequency spectrum with a second predetermined threshold, and sets an output sound flag to indicate presence of a talkspurt in the speech data (Col. 14 line 56 - Col. 15 line 6);

(g) an echo canceller module comprising:

a state controller that identifies states of the voice/noise data and the speech data by monitoring the input and output sound flags, and outputs an appropriate control command which is the identified states (Col. 17 lines 49-64, state machine controlling echo cancellation);

an echo cancel unit that performs a subtraction process and an echo training process depending on the control command, wherein the subtraction process produces a pseudo echo signal by applying echo path characteristics on the speech data and outputs the echo- cancelled sound signal by subtracting the produced pseudo echo signal from the voice/noise data, and wherein the echo training process updates the echo path characteristics (Col. 3 lines 18-38).

**NOTE:** Examiner construes a pseudo echo signal as merely a signal in which echo cancellation has occurred as taught in Fig. 21 (element 63a output) of the present invention. Further, Examiner construes the concept of training in the context of the present invention to be merely an adaptation method to echo cancellation as explicitly taught by Sih, and in light of the present invention (specification page 39).

However, though Sih teaches the analysis of spectral characteristics, Sih fails to teach a voice/noise flatness factor indicating flatness of the voice/noise frequency spectrum and finds a maximum value *of the voice/noise frequency spectrum*.

Borth teaches that an apparatus and method is provided for automatically performing background noise estimation for use with an acoustic noise suppression system, wherein the background noise from a noisy pre-processed input signal--the

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speech-plus-noise signal available at the input of the noise suppression system--is attenuated to produce a noise-suppressed post-processed output signal--speech-minus-noise signal provided at the output of the noise suppression system--by spectral gain modification. The automatic background noise estimator includes a noise estimation means which generates and stores an estimate of the background noise power spectral density based upon the pre-processed input signal. The background noise estimator of the present invention further includes a noise detection means, such as an energy valley detector, which performs the speech/noise decision based upon the post-processed signal energy level. The noise detection means provides this speech/noise decision to the noise estimation means such that the background noise estimate is updated only when the detected minima of the post-processed signal energy is below a predetermined threshold. The novel technique of implementing post-processed speech energy for the noise detection means, thereby controlling the pre-processed speech energy to the noise estimation means, allows the present invention to generate a highly accurate background noise estimate for an acoustic noise suppression system (Borth Col. 2 line 46 – Col. 3 line 6).

Further, Borth teaches energy valley detector 440 utilizes the overall energy estimate from combiner 460 to detect the pauses in speech. This is accomplished in three steps. First, an initial valley level is established. If the background noise estimator has not previously been initialized, then an initial valley level is created by loading initialization value 455. Otherwise, the previous valley level is maintained as its post-processed background noise energy history. Next, the previous (or initialized)

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valley level is updated to reflect current background noise conditions. This is accomplished by comparing the previous valley level to the value of the single overall energy estimate from combiner 460. A current valley level is created by this updating process, which will be described in detail in FIG. 6b. The third step performed by energy valley detector 440 is that of making the actual speech/noise decision. A preselected valley level offset, represented in FIG. 4 by valley offset 445, is added to the updated current valley level to produce a noise threshold level. Then the value of the single overall (post-processed) energy estimate is again compared, only this time to the noise threshold level. When this energy estimate is less than the noise threshold level, energy valley detector 440 generates a speech/noise control signal (valley detect signal) indicating that no voice is present (Borth Col. 7 lines 3-29).

Furthermore, like Sih Borth teaches updating and also teaches comparison of previous states to determine the greatest and least energy levels, wherein Borth teaches updating the background noise energy history maintained by the valley detector. The previous valley level is increased at a very slow rate (on the order of a one second time constant) when the instantaneous energy estimate value is greater than the previous valley level of the background noise estimate. This occurs when voice is present. Conversely, the previous valley level is rapidly decreased (on the order of a 40 millisecond time constant) when the instantaneous energy estimate is less than the previous valley level--when minimal background noise is present. Accordingly, the background noise history is continuously updated by slowly increasing or rapidly decreasing the previous valley level, depending upon the amount of background noise

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in the current post-processed speech energy estimate (Borth Col. 8 line 62 – Col. 9 line 10).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Sih to incorporate a voice/noise flatness factor indicating flatness of the voice/noise frequency spectrum and finds a maximum value of the voice/noise frequency spectrum as taught by Borth to allow for the acquisition of frame or sample points in a speech signal where decreases or increases in energy are used to update a system to further reduce any noise disturbances in pre and post processed speech, such as an echo (or double talk as taught by Sih) (Borth Col. 8 line 62 – Col. 9 line 10)

However, Sih in view of Borth fails to teach wherein the input sound flatness evaluator calculates an average of spectral components of the voice/noise data, normalizes the resulting sum of the differences by dividing by the calculated average, and outputs a normalized voice/noise flatness factor

Ananthaiyer teaches a voice detector that maintains an average difference of the minimum AMDF values AvgDiffAMDF which is a running sum of the differences between the minimum local AMDF value for the interval  $m$  and the minimum local AMDF value for the previous interval  $(m-1)$  (Ananthaiyer Col. 4 lines 43-48).

Further, Ananthaiyer teaches normalization through an update interval logic and decision interval logic of FIG. 7. A signal detector apparatus for characterizing a signal over a detection cycle  $i$ , the detection cycle  $i$  having a number of intervals, each interval

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having a predetermined number of input samples 650, the device comprising: first logic 654 for determining an Average Magnitude Difference Function (AMDF) value 652 for each of a predetermined range of pitch frequencies  $K$  over the intervals; second logic 656 for determining an average difference AMDF value over the intervals equal to the sum of the difference between a first minimum AMDF value from each interval  $m$  and a second minimum AMDF value from each interval  $(m-1)$ ; third logic 658 for determining a minimum AMDF value over the intervals; fourth logic 660 for determining a sum of the AMDF values over the intervals; fifth logic 662 for computing a first metric equal to the minimum AMDF value over the intervals divided by the sum of the AMDF values over the intervals; sixth logic 664 for computing a second metric equal to the average difference AMDF value over the intervals divided by the sum of the AMDF values over the intervals; and seventh logic 666 for utilizing said first metric and said second metric to determine whether the signal is one of a noise signal, a tone signal, and a voice signal (Ananthaiyer Col. 8 lines 33-55).

Furthermore, Ananthaiyer teaches a noise and silence discerning operation and adjustable threshold value method of determining if the signal is a noise signal in step 404. In step 404, the signal is characterized as noise, and the logic proceeds to step 410, if any of a number of conditions is true. First, the signal is characterized as noise if the AMDF.sub.sum is equal to zero. This case represents the detection of absolute silence. Second, the signal is characterized as noise if the AMDF.sub.norm for the current detection cycle  $i$  is greater than a threshold  $N$ , representing a large value of AMDF.sub.norm. Finally, the signal is characterized as noise if the signal detected in

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the previous detection cycle (i-1) was noise and the AMDF.sub.norm is greater than a threshold N2N which is less stringent than N. This condition applies the rule from the first observed characteristic described above, specifically that the threshold for detecting subsequent noise signals can be made less stringent (Ananthaiyer Col. 6 lines 39-56).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Sih in view of Borth to incorporate an average of spectral components of the voice/noise data, normalizes the resulting sum of the differences by dividing by the calculated average, and outputs a normalized voice/noise flatness factor as taught by Ananthaiyer to allow for an average difference AMDF value over a group of intervals divided by the sum of the AMDF values over the intervals; and a first metric and second metric to determine whether the signal is one of a noise signal, a tone signal, and a voice signal, wherein noise is further classified and double checked to be purely noise or tonal where absolute silence and speech may be ruled out through a redundant method of threshold comparison (Ananthaiyer Col. 8 lines 33-55).

Re claim 34, Sih teaches the echo canceller according to claim 33,

(a) wherein, when the input sound flag and the output sound flag are present, a subtract command is given as the control command (Col. 17 lines 49 – Col. 18 line 17, state machine controlling echo cancellation);

(b) wherein, when the input sound flag is present and the output sound is absent, both the subtract command and a train command are not given as the control command (Col. 17 lines 49 – Col. 18 line 17, state machine controlling echo cancellation);

(c) wherein, when the input sound flag is absent and the output sound flag is present, both the subtract command and the train command are given as the control command (Col. 17 lines 49 – Col. 18 line 17, state machine controlling echo cancellation, & Fig. 1, input and output selection, Fig. 2 and Fig. 14a-c, controlling state operation of near-end and far-end speech, wherein comparison of near and far end speech are used in the state transition);

(d) wherein, when the input sound flag and the output sound flag are absent, both the subtract command and the train command are not given as the control command (Col. 17 lines 49 – Col. 18 line 17, state machine controlling echo cancellation, & Fig. 1, input and output selection, Fig. 2, and Fig. 14a-c, controlling state operation of near-end and far-end speech, wherein comparison of near and far end speech are used in the state transition);

wherein, when the echo cancel unit receives the subtract command, the echo cancel unit produces the pseudo echo signal by applying estimated echo path characteristics to the speech data and subtracts the pseudo echo signal from the voice/noise data (Col. 3 lines 18-38);

and wherein, when the echo cancel unit receives the train command, the echo cancel unit updates the echo path characteristics with reference to the echo-cancelled

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sound signal, the updated echo path characteristics being used a next time the echo cancel unit produces a pseudo echo signal (Col. 3 lines 18-38).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael C. Colucci whose telephone number is (571)-270-1847. The examiner can normally be reached on 9:30 am - 6:00 pm, Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (571)-272-7602. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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